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Chas. G. Woodward.

No. 1668

DESCRIPTION

OF THE

DEFLECTION BOARD

(Model of 1906)

FOR 12-INCH MORTAR

MECHANICAL FEATURES
AND RULES GOVERNING ITS CARE AND
PRESERVATION IN SERVICE

(2 Plates)

APRIL 4, 1907
REVISED DECEMBER 13, 1907

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1908

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DESCRIPTION OF THE DEFLECTION BOARD, MODEL OF 1906, FOR 12-INCH MORTAR.

(2 plates.)

1. The deflection board, model of 1906, for 12-inch mortar, consists of a built-up wooden base of cherry, of mahogany finish, called the block (6M 1), to which is secured a bronze frame (6A 1), supporting the cylinder (5B), the shield (5C 1), and the drift scale, deflection scale, pointers, traversing screws, and wheels, shown in the deflection board, assembled (5A 1). The purpose of the board is to afford a means of determining rapidly the full correction in azimuth to be applied in 12-inch mortar firing. This pamphlet will discuss the mechanical features of the instrument and its care and preservation. The use of the instrument in conjunction with the other instruments of the mortar fire control and direction system is discussed in publications issued by the Chief of Artillery.

2. The final correction given by the board as the result of any assumed prior conditions as to elevation, weight of projectile, etc., is obtained by mechanically operating three pointers over three graduated scales. The pointers are the azimuth and deflection pointer (5Q), the small pointer brazed to the drift scale (6G), and the small pointer brazed to the deflection scale (6L). The scales are the azimuth scale, engraved for whole degrees on the cylinder (5B), and for fractional parts of degrees, least reading $\frac{5}{100}$, on the frame (6A 1); the drift scale, engraved on the drift scale slide (6N); and the deflection scale, engraved on the deflection scale (6L).

3. The whole degrees of the azimuth scale, engraved on the cylinder (5B), are arranged in 36 rows of figures spaced evenly about the outside of the cylinder, as shown at (5B). Each row begins with some whole degree number terminating in the number 1, and contains altogether 21 whole degree numbers. An inspection of (5B) will show this clearly. The reason for engraving the whole degree numbers in this way is that the movements of the various pointer slides must necessarily be limited, for, if for any reason corrections would involve moving the slides to which the pointers are attached so far either to the right or left as to run them off of their traversing screws, the board would, temporarily at least, be out of commission

and further rapid work would be prevented. To overcome any such possibility stops limiting the movement of all slides have been provided. If, therefore, in setting any of the pointers, a stop is encountered, grasp the handle and ratchet ring (5E) on the left end of cylinder and move the azimuth scale on cylinder either forward or backward one row of whole degree numbers, depending upon whether the stop has been encountered toward the left extremity or right extremity of movement of any of the slides. For, in moving toward the left, whole numbers on the scale are of decreasing value; hence if a stop is encountered on the left, by moving the cylinder one row forward the next row, 10 whole degrees in value less than the original row, is brought to the reading opening under the guard, and the adjustment of the pointers can again be undertaken by running all to the right of the instrument a distance equal to 10 whole degree spaces. A rapid manipulation of the pointer is provided for in the pitch of the various operating screws, pinions, and racks.

4. It should be noted that the scale of fractional parts of degrees, least reading $\frac{5}{100}$ degree, is stationary and does not move when the cylinder is revolved. The whole degree numbers on the cylinder are so spaced that as each comes opposite the reading opening under the shield it is situated opposite a whole degree graduation on the fixed part of the azimuth scale on the frame.

5. The drift scale, engraved on the drift-scale slide (6N), is a scale so graduated for the particular projectile in use as to make the indicated angular distance on the azimuth scale between the upper branch of the azimuth and deflection pointer (5Q) and the small pointer brazed on the drift scale equal to the angular drift, as indicated in the range tables for the projectile used, when the lower branch of the azimuth and deflection pointer (5Q) indicates the reference number " 3 " on the deflection scale, and the small pointer brazed to the deflection scale indicates on the drift-scale slide the elevation being used. Thus, consulting the view of the deflection board assembled (5A 1), the indicated angular distance between the pointers on the azimuth scale is $2'' .566=2^\circ 34'$, which is the drift of the 824-pound projectile fired from the 12-inch mortar, steel, at an elevation of 45 degrees, no matter what service velocity is being used. It should be noted that there are two drift-scale slides (6N) provided. One of these slides is graduated on one side for drift for the 824-pound projectile and on the other side for the 1,046-pound projectile. The second slide, which is kept in a pocket provided for it in the block (6M 1), is graduated for use with the subcaliber projectile. To remove a slide a small projection shown on the right allows the thumb or finger to exert pressure toward the right. The slide moves out easily and may then be inverted and returned, or the second slide may be substituted for it. A slide not

in use should habitually be kept in the pocket in the block (6M 1) to prevent bending or loss.

6. The deflection scale proper, engraved on the deflection scale (6L), is a scale of reference numbers, extending from 0 on the left to 6 on the right and with 3 in the center. The distance between whole numbers is equal to the distance between whole degrees on the azimuth scale. The least reading is the same as that of the azimuth scale.

7. The method of moving the cylinder, containing the whole degree numbers of the azimuth scale, has already been described. The other movements of the board affect directly the position of the pointers, and will now be described. Examining the assembled view of the deflection board (5A 1), there will be seen on the extreme right a handwheel, called the main traversing wheel (5J). This wheel is attached to the right end of the main traversing screw (5H). The main traversing screw is a double screw, of square thread and rapid pitch, passing through the drift scale (6G), and traversing the latter right or left. As the drift scale (6G) supports all pointers of the board, either directly or by attachment to screws or slides, which in turn are assembled to the drift scale (6G), all pointers must move together when the main traversing screw is operated to traverse (6G), and during such movement all pointers will retain their relative positions. In other words, the main traversing screw is operated only to set the small pointer brazed to (6G) at the desired angle on the azimuth scale. The corrections for drift or deflection are not affected by operating the main traversing screw.

8. To make a correction for drift, grasp the deflection scale knob (6H) and rotate it either to the right or left. This knob terminates in a pinion, which is geared into a rack on the drift scale. Hence, when the knob (6H) is revolved, it moves the deflection scale (6L) in a runway cut for it in the drift scale (6G) and carries with it the azimuth and deflection pointer (5Q) and the small pointer brazed to the deflection scale itself. Movement of knob (6H) therefore results in change in position of the two latter pointers with reference to the small pointer brazed to the drift scale, but does not alter the relative position of these pointers with reference to one another. It simply allows setting of the small pointer brazed to the deflection scale to the elevation to be used, which corrects automatically for drift, as already explained in paragraph 5.

9. To make a correction for deflection, the knurled end of the azimuth and deflection pointer screw (5N) is grasped and rotated either forward or backward. Rotation of this screw results in moving the azimuth and deflection pointer (5Q) either to the left or right, the upper branch traveling over the azimuth scale and the lower branch

traveling over the deflection scale. The amount of movement is of course regulated by the travel on the deflection scale.

10. The method of operating the various screws, handles, and knobs has now been described in detail. To group movements—that is, to make drift and deflection correction at the same time—it will not affect the result if either of the corrections is made first or last. In other words, the final answer is not affected if the drift correction is made before the deflection, or *vice versa*.

11. All exposed metal surfaces of this instrument, except wearing surfaces, are given a sand-blast finish, covered with a coat of transparent lacquer. Graduations, figures, and letters are filled in with black. The parts of the instrument subject to friction, as trunnion bearings, translating screws, etc., should be oiled with clock oil when necessary. Where parts are not readily accessible for oiling, oil holes have been provided. An excess of oil should not be used. Should an oil spot or mark develop on any part of the board having the sand-blast finish, it may be readily wiped off, using a cloth and a little soap and water. The place should be thoroughly dried after cleaning and a thin coat of transparent lacquer applied if the original covering was removed during the operation of cleaning. If no lacquer is available, a thin coat of machine oil, evenly applied, may be used temporarily.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ORDNANCE,
Washington, December 13, 1907.

April 4, 1907.
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38766–32.
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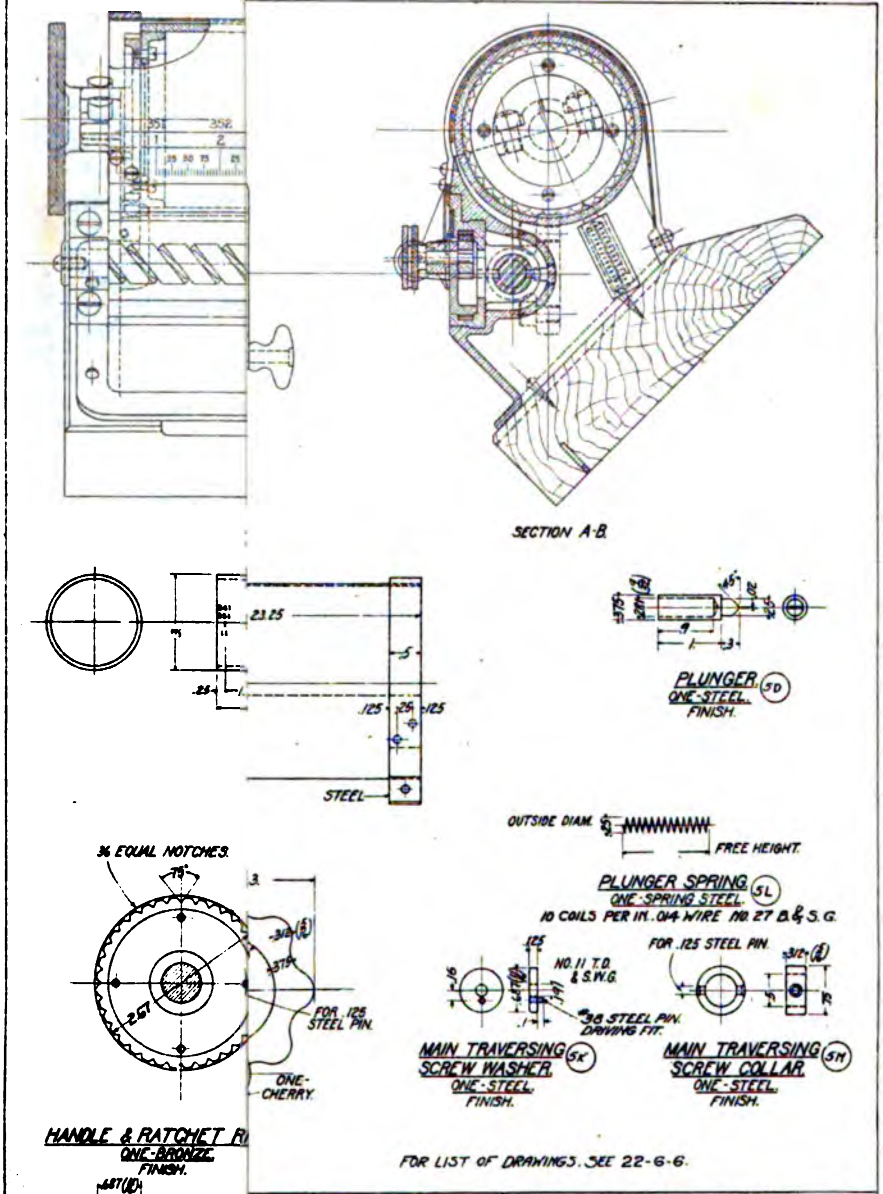
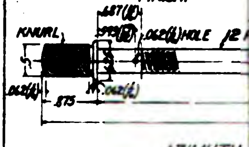
PLATE 9





FOR LIST OF DRAWINGS. SEE 22-6-6.

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DEFLECTION BOARD
MODEL OF 1906.
FOR 12 INCH MORTAR.
ASSEMBLED VIEWS AND DETAILS.
FRANKFORD ARSENAL, U. S. A., JUNE 22, 1906.

E.J.B. E.J.B. E.J.B.

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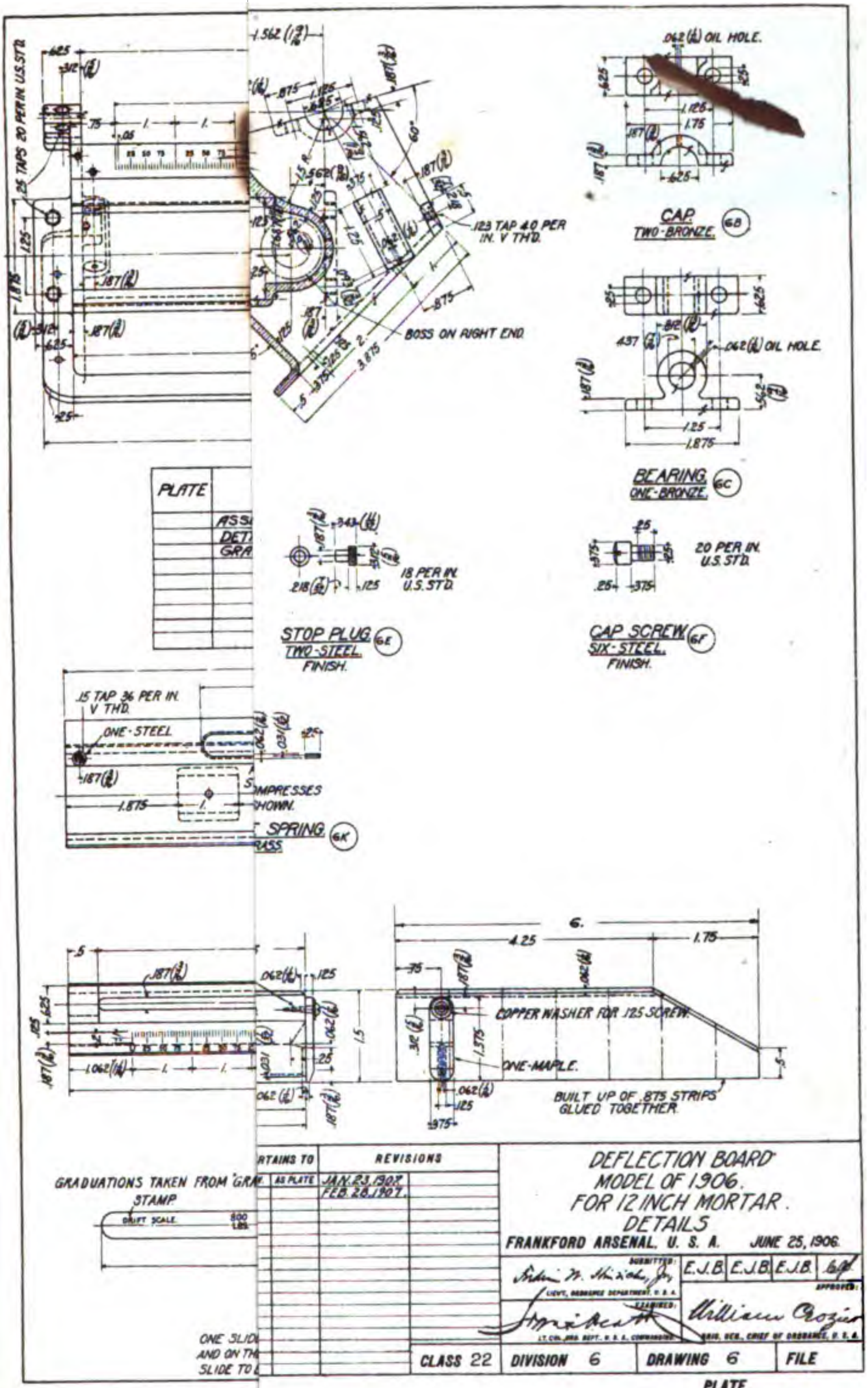
PLATE II



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DEFLECTION BOARD
MODEL OF 1906.
FOR 12 INCH MORTAR.
DETAILS

FRANKFORD ARSENAL, U. S. A. JUNE 25, 1906.

SUBMITTED:
LIEUT., ORDNANCE DEPARTMENT, U. S. A.

E.J.B. | E.J.B. | E.J.B.

EXAMINED:
LT. COL., ORD. DEPT., U. S. A., COMMANDING.

APPROVED:
William Crozier
BRIG. GEN., CHIEF OF ORDNANCE, U. S. A.

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